

Modeling and optimization of flow related drilling operations/ ECD-management using advanced control regimes

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Flow related drilling operations, like hoisting and lowering the drillstring (tripping) and breaking the gel structure of the drilling fluid during circulation start-up, are time- and cost consuming, and it is desirable to perform these as quickly as possible. However, operations like these will affect the well pressure and too fast tripping/gel-breaking could give an unstable well and safety issues.

In this PhD-work an advanced model based control regime will be developed for controlling the well pressure during such flow related drilling operations. By achieving better control of the pressure in the well, not only faster and cheaper operations are possible, but also safety will be improved.

Optimized control of the well pressure will require prediction of future responses (by means of a mathematical model) and coordinated control of various variables/drilling machines like mud pump (flow rate), draw-works (tripping speed) and top drive (string rotation rate). Detailed mathematical models for simulation purposes have been developed over the last years, but these are not well suited to be combined with advanced process control theory. Therefore new models for control purposes will be developed.